

We claim:

1. An applicator for cutaneous delivery of a bioactive composition to a cutaneous target, comprising:  
a jet dispenser comprising an orifice, and a container which holds and delivers the bioactive composition to said orifice for ejection therethrough; and  
a spacer positioned between the dispenser orifice and the target during ejection of the bioactive composition to the target.
2. An applicator according to claim 1, wherein the spacer is supported by the dispenser.
3. An applicator according to claim 1, wherein the spacer is attached to the cutaneous target.
4. An applicator according to claim 1, further comprising an adhesive applicator patch for application to the cutaneous target.
5. An applicator according to claim 1, wherein the applicator is an applicator for transdermal delivery of a bioactive composition capable of transdermal flux.
6. An applicator according to claim 1, further comprising a bioactive composition in the container.
7. An applicator according to claim 6, wherein the bioactive composition is a pharmaceutical composition.
8. An applicator according to claim 7, wherein the pharmaceutical composition is capable of transdermal delivery.
9. An applicator according to claim 1, wherein the dispenser is a thermal droplet jet dispenser.

10. An applicator according to claim 1, wherein the dispenser is a piezoelectric droplet jet dispenser.
11. An applicator according to claim 1, further comprising a controller which automatically ejects the bioactive composition from the dispenser orifice at selected times.
12. An applicator according to claim 11, wherein the controller is a microprocessor programmed to dispense the bioactive composition at predetermined intervals.
13. An applicator according to claim 1, wherein the container comprises multiple container modules.
14. An applicator according to claim 13, wherein the multiple container modules are removable from the dispenser.
15. An applicator according to claim 13, wherein at least two of the container modules contain a bioactive substance.
16. An applicator according to claim 15, wherein at least one of the container modules contains a bioactive agent in powder form.
17. An applicator according to claim 15, wherein at least two of the container modules contain different bioactive substances that combine after ejection to produce a bioactive effect.
18. An applicator according to claim 17, wherein at least one of the bioactive substances is a penetration enhancer that improves cutaneous penetration of another bioactive substance.
19. An applicator according to claim 18, wherein the penetration enhancer is dimethyl sulfoxide (DMSO).

20. An applicator according to claim 15, wherein the bioactive composition is a nitrate, an anti-hypertensive drug, an analgesic, a hormone or an analogue thereof, or nicotine or an analogue thereof.

21. An applicator according to claim 20, wherein:  
the dispenser is a piezoelectric droplet jet dispenser; and  
the nitrate is nitroglycerin.

22. An applicator according to claim 20, wherein the anti-hypertensive drug is clonidine or minoxidil, the analgesic is fentanyl, or the hormone is estrogen or testosterone.

23. An applicator according to claim 1, further comprising an attachment member that selectively retains the dispenser in prolonged contact with the cutaneous target.

24. An applicator according to claim 23, wherein the attachment member comprises a strap.

25. An applicator according to claim 23, wherein the attachment member comprises an adhesive.

26. An applicator according to claim 1, wherein:  
the cutaneous target comprises skin covering a subject; and  
the spacer comprises a sealing member that selectively substantially seals the dispenser against the skin to form a substantially closed chamber when the dispenser is in contact with the skin.

27. An applicator according to claim 26, wherein the sealing member is a continuous elastomeric seal.

28. An applicator according to claim 1, further comprising an indicator which indicates a degree of depletion of the bioactive composition in the dispenser.

30. An applicator according to claim 1 wherein:  
the cutaneous target comprises skin covering a subject having a measurable parameter; and  
the applicator further comprises:  
a bio-sensor which monitors said parameter of the subject and generates a signal in response thereto; and  
a controller which automatically dispenses the bioactive composition from the dispenser orifice in response to said signal.
31. An applicator according to claim 30 wherein the bio-sensor comprises a pulse oximetry device.
32. An applicator according to claim 31 wherein said parameter comprises pulse rate.
33. An applicator according to claim 31 wherein said parameter comprises blood oxygenation levels.
34. An applicator according to claim 31 wherein said bio-sensor communicates said signal to the controller by infrared communication.
35. An applicator according to claim 31 wherein said bio-sensor communicates said signal to the controller by radiowave communication.
36. An applicator according to claim 1, further comprising a display which displays information about said composition.
37. An applicator according to claim 1, further comprising an interface which receives a memory storage device containing dosage information concerning administration of said composition.
38. An applicator according to claim 1, further comprising a keypad input which receives dosage information concerning administration of said composition.

39. An applicator according to claim 1, further comprising:  
a display which displays information about said composition, including various dosages; and  
a keypad input including scroll keys which when activated cause the display to selectively show said various dosages.
40. An applicator according to claim 1, further comprising a controller which is programmable.
41. An applicator according to claim 40, wherein said controller is programmable from a remote computer in communication with said controller.
42. An applicator according to claim 1, further comprising:  
a main body which supports said container; and  
a dispensing head which supports said orifice.
43. An applicator according to claim 42, wherein said dispensing head supports plural orifices each fluidically coupled to said container.
44. An applicator according to claim 42, further comprising a flexible link which couples together said main body and said dispensing head.
45. An applicator according to claim 43, wherein said flexible link is hollow and contains a fluid conduit which fluidically couples said container to said orifice.
46. An applicator according to claim 1, further comprising a main body which supports said container and said orifice.
47. An applicator according to claim 46, wherein said container is removable from the main body.
48. An applicator according to claim 1, further comprising a sensor.

49. An applicator according to claim 48, further comprising a controller in communication with said sensor.

50. An applicator according to claim 49, wherein:  
said sensor comprises an optical sensor;  
said target changes color following delivery of the bioactive composition; and  
said optical sensor detects said color change and in response thereto, the controller ceases ejection of said composition.

51. An applicator according to claim 49, wherein:  
said sensor comprises an optical sensor;  
said target changes color following absorption of the bioactive composition; and  
said optical sensor detects said color change and in response thereto, the controller causes said orifice to eject said composition.

52. An applicator according to claim 49, wherein:  
said sensor comprises an optical sensor;  
the container comprises two container modules each containing different bioactive substances;  
the target has indicia detectable by said optical sensor indicative of one of said different bioactive substances; and  
the controller causes said orifice to eject said one of said different bioactive substances.

53. An applicator according to claim 1, further comprising a dermal patch between said orifice and said target.

54. An applicator according to claim 53, wherein the dermal patch is of an absorbent material which receives said delivery of said composition.

55. A kit for filling an applicator having a jetting orifice with a bioactive composition for cutaneous delivery through ejection from said orifice to a subject, the kit comprising:

a container which contains the bioactive substance, with the container having an interface to fluidically couple the container with the applicator to deliver said composition to the orifice; and

a dermal patch for placement on the subject to receive said composition from said orifice when spaced a selected distance therefrom.

56. A kit according to claim 55, further comprising instructions for dispensing the bioactive composition from the applicator on to the patch.

57. A kit according to claim 55, further comprising a bioactive composition in the container.

58. A kit according to claim 55, further comprising plural containers.

59. A kit according to claim 58, wherein at least two of the plural containers contain the same bioactive composition.

60. A kit according to claim 58, wherein at least two of the plural containers contain different bioactive compositions.

61. A kit according to claim 60, wherein said different bioactive compositions combine after ejection to produce a bioactive effect.

62. A kit according to claim 60, wherein at least one of the bioactive compositions is a penetration enhancer that improves cutaneous penetration of another bioactive composition.

63. A kit according to claim 62, wherein the penetration enhancer is dimethyl sulfoxide (DMSO).

64. A kit according to claim 58, wherein at least one of the plural containers contains a bioactive composition in powder form.
65. A kit according to claim 55, wherein the bioactive composition is suitable for cutaneous administration.
66. A kit according to claim 55, wherein the bioactive composition is suitable for transdermal administration.
67. A kit according to claim 55, wherein the bioactive composition is a pharmaceutical composition.
68. A kit according to claim 55, wherein said bioactive composition is capable of transdermal flux.
69. A kit according to claim 55, wherein the bioactive composition is a nitrate, an anti-hypertensive drug, an analgesic, a hormone or an analogue thereof, or nicotine or an analogue thereof.
70. A kit according to claim 69, wherein the nitrate is nitroglycerin.
71. A kit according to claim 69, wherein the anti-hypertensive drug is clonidine or minoxidil, the analgesic is fentanyl, or the hormone is estrogen or testosterone.
72. A kit according to claim 55, wherein the patch has an adhesive portion for application to the subject.
73. A kit according to claim 72, further comprising a removable release sheet overlying the adhesive portion during shipment.
74. A kit according to claim 55, wherein the patch has a replaceably removable moisture impervious cover layer.



75. A kit according to claim 55 for filling an applicator having a programmable controller which controls said ejection from said orifice in response to programming instructions, and the kit further contains said programming instructions.

76. A kit according to claim 75 for filling an applicator having an interface, wherein said programming instructions are stored on a memory storage device which is received by said interface to supply said instructions to said controller.

77. A kit according to claim 76, wherein said memory storage device is supported by said container.

78. A kit according to claim 76, wherein said interface comprises a slot, and said memory storage device is received within said slot.

79. A kit according to claim 55, wherein said container is refillable with said bioactive composition.

80. A kit for administering a bioactive composition to a subject, the kit comprising:  
a jet dispenser comprising an orifice, and a container which delivers the bioactive composition to said orifice for ejection therethrough; and  
a retainer for retaining the dispenser in contact with skin of a subject.

81. A kit according to claim 80, further comprising a controller which controls said ejection through the orifice in response to information about a physiological condition of the subject

82. A kit according to claim 82, further comprising a sensor which senses a physiological condition of the subject, and provides information about said condition to the controller.

83. A method of administering a bioactive composition to a subject, the method comprising:

applying to a cutaneous surface of the subject a jet dispenser comprising a container holding the bioactive composition;

dispensing the bioactive composition from the dispenser through at least one orifice toward the cutaneous surface; and

retaining the bioactive composition in prolonged contact with the cutaneous surface.

84. A method according to claim 83, wherein retaining the bioactive composition in prolonged contact with the cutaneous surface comprises dispensing the bioactive composition on to a dermal patch that is retained on the cutaneous surface.

85. A method according to claim 84, wherein the dermal patch is an adhesive dermal patch that is applied to the cutaneous surface prior to dispensing the bioactive composition from the dispenser.

86. A method according to claim 85, wherein the dermal patch comprises a selectively removable cover that is removed prior to dispensing the bioactive composition into the patch, and is subsequently replaced on the patch to improve retention of the bioactive composition in the patch.

87. A method according to claim 83, wherein retaining the bioactive composition in prolonged contact with the cutaneous surface comprises providing a seal between the dispenser and cutaneous surface, to form a substantially sealed chamber between the dispenser and the cutaneous surface, and retaining the dispenser in prolonged contact with the seal.

88. A method according to claim 83, further comprising repeatedly dispensing the bioactive composition toward the cutaneous surface.

89. A method according to 88, further comprising resupplying the dispenser with the bioactive substance.

90. A method according to claim 89, wherein resupplying the dispenser comprises replacing a container in the dispenser.

91. A method of administering a bioactive composition to a subject, the method comprising:

applying a cutaneous patch to skin of the subject; and

dispensing the bioactive composition from a jet dispenser by ejection through an orifice to the patch using inkjet technology.

92. A method according to claim 91, further comprising dispensing the bioactive composition to the patch at intervals to provide sustained dosages of the bioactive composition from the patch to the subject.

93. A method according to claim 92, wherein the intervals are preselected intervals.

94. A method according to claim 91 further comprising dispensing the bioactive composition from the dispenser to the patch when an amount of the bioactive composition in the patch falls below a desired level.

95. A method according to claim 91:

wherein said dispensing further comprises dispensing a second substance from the dispenser to the patch; and

the method further comprises mixing the bioactive composition with dispensing.

96. A method according to claim 95 wherein said mixing occurs between said orifice and said patch.

97. A method according to claim 95 wherein said mixing occurs within said patch.

98. A method according to 91 further comprising containing said bioactive composition a container portion of said jet dispenser prior to said dispensing.

99. A method according to claim 98 further comprising refilling said container with said bioactive composition.

100. A method according to claim 99 further comprising removing said container from the jet dispenser prior to said refilling, and after said refilling, replacing said container for further dispensing.

101. An applicator according to claim 1, wherein the dispenser comprises a silicon electrostatic actuated droplet jet dispenser.

102. A method according to claim 83, wherein said dispensing comprises using a thermal droplet jet dispenser.

103. A method according to claim 83, wherein said dispensing comprises using a piezoelectric droplet jet dispenser.

104. A method according to claim 83, wherein said dispensing comprises using a silicon electrostatic actuated droplet jet dispenser.

105. A method according to claim 91, wherein said inkjet technology used in said dispensing comprises thermal inkjet technology.

106. A method according to claim 91, wherein said inkjet technology used in said dispensing comprises piezoelectric inkjet technology.

107. A method according to claim 91, wherein said inkjet technology used in said dispensing comprises silicon electrostatic actuated inkjet technology.

108. A method according to claim 83, further comprising:  
optically reading subject identification information with an optical reading device of said jet dispenser;  
correlating said subject identification information with prescribed dosage information; and  
wherein said dispensing comprises dispensing the bioactive composition according to said prescribed dosage information.

109. A method according to claim 91, further comprising:  
optically reading subject identification information with an optical reading device of said jet dispenser;  
correlating said subject identification information with prescribed dosage information; and  
wherein said dispensing comprises dispensing the bioactive composition according to said prescribed dosage information.

110. An applicator according to claim 28, wherein said indicator comprises an indicator light.

111. An applicator according to claim 28, wherein said indicator comprises an audible signal.

112. An applicator according to claim 28, wherein said indicator comprises a tactile signal.

113. An applicator according to claim 112, wherein said tactile signal comprises a vibratory signal.

114. An applicator according to claim 48, wherein said sensor comprises an optical sensor.

115. An applicator according to claim 48, wherein said sensor comprises a mechanical sensor which monitors a physical parameter of a subject.

116. An applicator according to claim 115, wherein said mechanical sensor comprises an accelerometer.

117. An applicator according to claim 116, wherein said accelerometer monitors activity of a subject bearing said cutaneous target and adjusts said delivery in response to said monitoring.

118. A method according to claim 83, further comprising:  
monitoring a physical parameter of the subject; and  
in response to said monitoring, adjusting said dispensing.

119. A method according to claim 118, wherein said physical parameter comprises heartbeats.

120. A method according to claim 118, wherein said physical parameter comprises breathing.

121. A method according to claim 118, wherein said physical parameter comprises an activity in which the subject is engaged.

122. A method according to claim 121, wherein:  
said activity comprises participating in a sport; and  
said adjusting comprises dispensing an additional amount of said bioactive composition.

123. A method according to claim 118, wherein said monitoring comprises using a monitor portion of the jet dispenser.

124. A method according to claim 123, wherein said monitor portion comprises a mechanical sensor.

125. A method according to claim 124, wherein said mechanical sensor comprises an accelerometer.

126. A method according to claim 91, further comprising:  
monitoring a physical parameter of the subject; and  
in response to said monitoring, adjusting said dispensing.

127. A method according to claim 126, wherein said physical parameter comprises heartbeats.

128. A method according to claim 126, wherein said physical parameter comprises breathing.

129. A method according to claim 126, wherein said physical parameter comprises an activity in which the subject is engaged.

130. A method according to claim 129, wherein:  
said activity comprises participating in a sport; and  
said adjusting comprises dispensing an additional amount of said bioactive composition.

131. A method according to claim 126, wherein said monitoring comprises using a monitor portion of the jet dispenser.

132. A method according to claim 131, wherein said monitor portion comprises a mechanical sensor.

133. A method according to claim 132, wherein said mechanical sensor comprises an accelerometer.

134. A kit according to claim 80, further comprising a bioactive agent.

135. A kit according to claim 134, wherein said bioactive agent comprises a bioactive composition attracting agent selected from the group comprising a cream, a paste, or a salve.

136. A method according to claim 83, further comprising:  
applying a bioactive composition attracting agent to a treatment location on the cutaneous surface of the subject;  
pulling the bioactive composition toward said agent; and  
penetrating said agent with the bioactive composition to treat the treatment location with the bioactive composition.

137. An applicator according to claim 1, further including an activation device which may be manually triggered to eject said bioactive composition from the jet dispenser.

138. An applicator according to claim 137, further including plural activation devices each bearing a label corresponding to an event, with different dosages of the bioactive composition being ejected from the jet dispenser according to which of the plural activation devices is triggered.

139. An applicator according to claim 137, wherein the jet dispenser contains plural bioactive compositions, and the applicator further includes plural activation devices with different bioactive compositions being ejected from the jet dispenser according to which of the plural activation devices is triggered.

140. A method according to claim 83, further comprising manually triggering an activation device after said applying and before said dispensing, with said dispensing occurring in response to said triggering.

141. A method according to claim 91, further comprising manually triggering an activation device after said applying and before said dispensing, with said dispensing occurring in response to said triggering.

142. An applicator according to claim 1, further including a reservoir containing said bioactive composition and a fluid conduit to convey the bioactive composition from the reservoir to the jet dispenser.

143. An applicator according to claim 142, wherein said fluid conduit comprises tubing.



144. An applicator according to claim 142, wherein said reservoir comprises a collapsible bladder.

145. A kit according to claim 55, wherein said container comprises a collapsible bladder, and said interface comprises tubing.

146. A kit according to claim 80, wherein said container comprises a collapsible bladder, and the kit further includes a fluid conduit to convey the bioactive composition from the bladder to the jet dispenser.

147. An applicator according to claim 146, wherein said fluid conduit comprises tubing.

148. A method according to claim 83, further comprising:  
storing the bioactive composition in a collapsible bladder; and  
conveying the bioactive composition from the collapsible bladder to the jet dispenser.

149. A method according to claim 148 wherein said conveying comprises conveying the bioactive composition through tubing.

150. A method according to claim 91, further comprising:  
storing the bioactive composition in a collapsible bladder; and  
conveying the bioactive composition from the collapsible bladder to the jet dispenser through tubing.